Department of Computational Science

CMPT 429.3/CMPT 833.3

Final Examination

Closed Book

Marks   Time: 2 hours   December 16, 1993

15 1. Construct a context-free grammar that generates the language

$$\{a^n b^m \mid n \neq m \text{ and } n, m \geq 0\}$$

15 2 (a) In the context of SLR(1) parsing <u>define</u> and <u>explain</u> the significance of the terms <u>viable prefix</u> and <u>valid item</u>. Using an example grammar, illustrate these terms.

(b) <u>Extend</u> the definition for valid item to deal with LR(1) grammars. <u>Define</u> and <u>illustrate</u> how to compute the lookahead and closure of an LR(1) item.

15 3. Given the following grammar:

$S' \rightarrow S\#$

$S \rightarrow aABbCD \mid \in$

$A \rightarrow ASd \mid \in$

$B \rightarrow SAc \mid eC \mid \in$

$C \rightarrow Sf \mid Cg \mid \in$

$D \rightarrow aBD \mid \in$

(a) Determine the set of nullable nonterminals.

(b) Find the FIRST and FOLLOW sets for the grammar.

(c) Determine if this grammar is LL(1). Explain!

15 4. Given the following grammar:

```
0.          S' -> S#
1., 2.      S -> (AS) | (b)
3., 4.      A -> (SaA) | (a)
```

(a) Construct the LR(0) machine for this grammar.

(b) Is the grammar SLR(1)? Why or why not?
If it is give the parsing tables.

15   5.   Given the following grammar:

0. $S' \rightarrow S$
1., 2. $S \rightarrow 0S1 \mid A$
3., 4. $A \rightarrow 1A \mid 1$

(a) Construct the canonical sets of items for an LR(1) machine.

(b) Is the grammar LR(1)? Why or why not?

15   6.   You are to compare LL and LR parsers. First identify suitable criteria (features) which can be used as a basis of comparison. Then using these features, compare LL and LR parsers.

10   7.   What were the most significant programming language issues that were encountered in your project? Explain!